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^{68}Ga-PSMA PET/MR–Positive Peritoneal Metastasis in the Falciform Ligament in Recurrent Prostate Cancer

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Abstract: Synchronous or metachronous metastases develop in approximately one third of all prostate cancer (PCa) patients. Main sites of metastasis include lymph nodes, bone, lung and liver. Secondary peritoneal carcinomatosis is very rare in PCa, with only a few published cases. ^{68}Ga-PSMA PET–based imaging is a promising tool for staging and restaging PCa. We report a case of ^{68}Ga-PSMA PET/MR–positive peritoneal metastasis as site of primary relapse after definitive PCa treatment in a 58-year-old man with a prostate-specific antigen of 30 ng/mL at time of the study. Exploratory laparoscopy and subsequent histopathologic examination confirmed nonascitic peritoneal PCa carcinomatosis.

Key Words: ^{68}Ga-PSMA, peritoneal carcinomatosis, PET/MRI, prostate cancer

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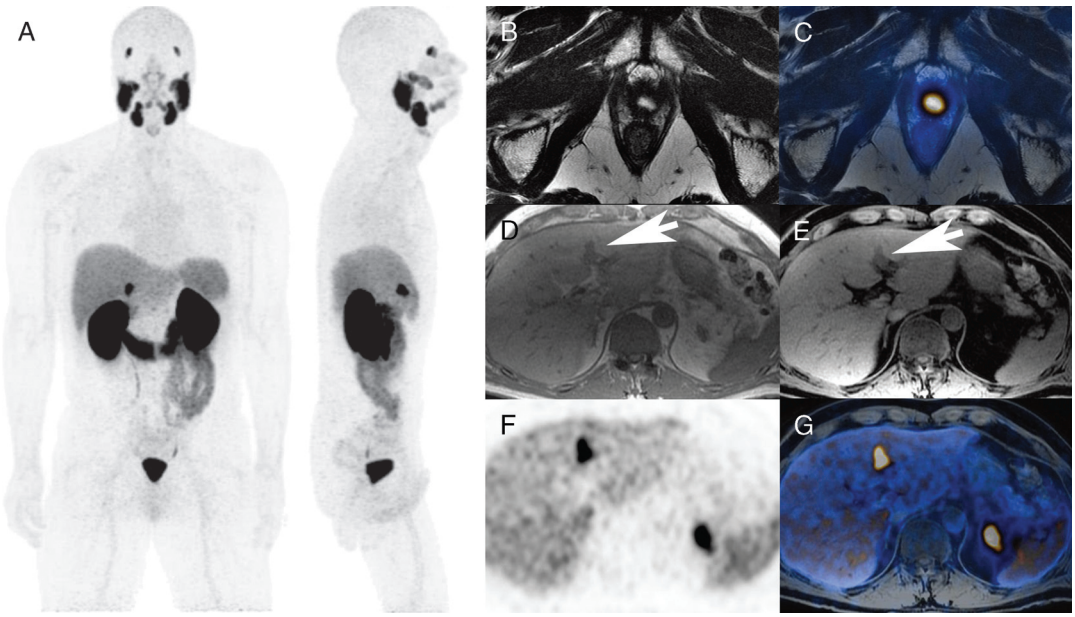

FIGURE 1. ^{68}Ga prostate-specific membrane antigen (PSMA) PET/MRI. A 58-year-old man previously treated with robotic-assisted radical prostatectomy and lymph node sampling 11 years ago for a localized high-risk prostate cancer (pT2c, pN0 [0/2], cM0, R0, Gleason 4 + 4 = 8, preoperative prostate-specific antigen [PSA] 40 ng/mL), who also received salvage radiation therapy combined with 12 months of androgen deprivation for a para-anastomotic recurrence 18 months after surgery, was referred for ^{68}Ga-PSMA PET/MR for restaging because of previous repeated negative PET imaging (^{18}F-choline and ^{68}Ga-bombesin) despite continuously rising PSA values (PSA at time of imaging 30 ng/mL, with an estimated PSA doubling time of 11 months). **A**, Coronal and sagittal MIP of the ^{68}Ga-PSMA PET/MR showed a single PSMA-positive hepatic lesion of 1.5 × 2.7 cm with a SUVmax of 25.9. There was no evidence for local recurrence in the prostate bed on (**B**) axial T2-weighted images or (**C**) axial-fused PET/MR. No positive lymph nodes, bone metastases, or any sign of ascites was detected. On the axial (**D**) fat and (**E**) water weighted T1 3-dimensional dual-echo gradient-echo pulse DIXON-LAVA-Flex sequences, the lesion was slightly hypointense (arrow), with (**F**) high PSMA accumulation on axial PET and (**G**) fused PET/MR.

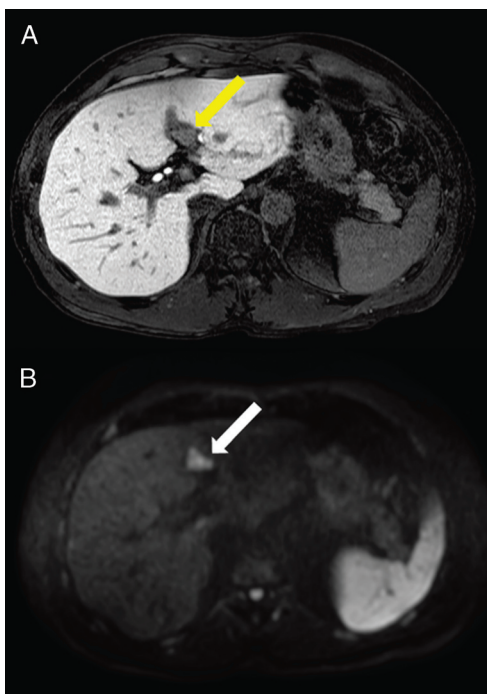

FIGURE 2. Primovist liver MRI. Because an intrahepatic lesion could not be ruled out on the PSMA PET/MR, the patient underwent a dedicated liver MRI to further characterize the PSMA-positive lesion. **A**, The Primovist MRI revealed a single peritoneal implant located on the falciform ligament without contrast enhancement (yellow arrow, T1 FFE with fat saturation, 20 minutes after contrast injection). **B**, On axial diffusion-weighted images (b = 800), a clear diffusion restriction was documented (arrow), further suggesting a peritoneal metastasis. Exploratory laparoscopy confirmed the lesion and revealed a disseminated peritoneal carcinomatosis. The histopathologic analyses of the biopsy specimens of the falciform ligament lesion and several other peritoneal implants of 1 to 2 mm confirmed an infiltration by an undifferentiated prostate adenocarcinoma Gleason 4 + 5 = 9. ^{68}Ga-PSMA PET imaging offers promising possibilities in restaging of biochemical recurrence, especially at very low PSA values of less than 1 ng/mL.[1–3] In addition, an accurate detection of nodal and bone metastases has been demonstrated.[4] Besides primary prostate cancer and its metastases, ^{68}Ga-PSMA uptake has been reported in hepatocellular carcinoma and different other malignant and nonmalignant entities with high neovasculature.[5–9] Peritoneal carcinomatosis in metastatic prostate cancer is extremely rare and has been described in only few single case reports.[10–13] ^{68}Ga-PSMA–based imaging might offer improved detection rates for such occult visceral metastases.